



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/589,243

05/03/2007

Tadashi Itoh

1035-648

6929

23117 7590 01/31/2011
NIXON & VANDERHYE, PC
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203

EXAMINER

ZHANG, YUANDA

ART UNIT

PAPER NUMBER

2828

MAIL DATE

DELIVERY MODE

01/31/2011

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/589,243	Applicant(s) ITO ET AL.	
	Examiner YUANDA ZHANG	Art Unit 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 August 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>08/14/06, 11/13/06, 04/14/09</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 08/14/06, 11/13/06 and 04/14/09 have been considered by the Examiner.

Drawings

3. Figures 17 and 18 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Art Unit: 2828

5. Claims 1-4 and 6-9 are rejected under 35 U.S.C. 102(a) as being anticipated by Kagotani et al. ("Laser Emission by Two-photon Resonant Excitation of Biexciton State in CuCl Quantum Dots", Research Institute of Electrical Communication, Tohoku University, vol. 14, pp. 247-250, 2003) (IDS filed on 08/14/06).

6. Regarding claim 1, Kagotani discloses a laser device (a solid-state laser, fig. 1) for causing lasing by using a semiconductor quantum dot, comprising a laser member (CuCl quantum dots, fig. 1) in which said semiconductor quantum dot is formed; a resonating section (NaCl crystal surfaces acting as an optical cavity) for resonating light generated in the laser member; and an excitation light source section (two-photon resonant excitation, fig. 1) for irradiating the laser member with excitation light whose energy corresponds to two-photon resonant excitation, so as to form a biexciton state in the semiconductor quantum dot by the two-photon resonant excitation (see abstract).

7. Regarding claim 2, Kagotani discloses a continuous irradiation period in which said excitation light source section continuously irradiates the laser member with excitation light is of the order of picoseconds (see abstract).

8. Regarding claim 3, Kagotani discloses a continuous irradiation period in which said excitation light source section continuously irradiates the laser member with excitation light is of the order of femtoseconds (see abstract).

9. Regarding claim 4, Kagotani discloses said laser member includes the semiconductor quantum dot and a base material retaining the semiconductor quantum dot; said semiconductor quantum dot is made of any one of CuCl, CuBr, CdSe, CdS

Art Unit: 2828

(CuCl quantum dots, fig. 1); and said base material is made of glass or alkali halide crystal (NaCl crystal, see abstract).

10. Regarding claim 6, Kagotani discloses a lasing method which causes lasing by using a semiconductor quantum dot (CuCl quantum dots, fig. 1), comprising the step of: forming a biexciton state in the semiconductor quantum dot by two-photon resonant excitation (fig. 1), so as to cause lasing by inducing light emission from the semiconductor quantum dot (see abstract).

11. Regarding claim 7, Kagotani discloses said biexciton state in the semiconductor quantum dot is formed by irradiating the semiconductor quantum dot with excitation light whose energy corresponds to said two-photon resonant excitation (fig. 1 and see abstract).

12. Regarding claim 8, Kagotani discloses a continuous irradiation period of said excitation light is of the order of picoseconds (see abstract).

13. Regarding claim 9, Kagotani discloses a continuous irradiation period of said excitation light is of the order of femtoseconds (see abstract).

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

14. Claims 6-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Masumoto et al. ("Proceeding of the 33rd Annual Meeting Vol. 2 (1978)", The Physical Society of Japan, p. 233, 3p-BG-8, 3p-BG-9) (IDS filed on 04/14/09) (Masumoto'1978).

15. Regarding claim 6, Masumoto'1978 discloses a lasing method which causes lasing by using a semiconductor quantum dot (CuCl quantum dots), comprising the step

Art Unit: 2828

of: forming a biexciton state in the semiconductor quantum dot by two-photon resonant excitation, so as to cause lasing by inducing light emission from the semiconductor quantum dot (two-photon resonance excitation of biexcitons in CuCl by picoseconds pulses, paragraph under 3p-BG-9).

16. Regarding claim 7, Masumoto'1978 discloses said biexciton state in the semiconductor quantum dot is formed by irradiating the semiconductor quantum dot with excitation light whose energy corresponds to said two-photon resonant excitation (paragraph under 3p-BG-9).

17. Regarding claim 8, Masumoto'1978 discloses a continuous irradiation period of said excitation light is of the order of picoseconds (paragraph under 3p-BG-9).

Claim Rejections - 35 USC § 103

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

19. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Art Unit: 2828

20. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masumoto et al. ("Biexciton lasing in CuCl quantum dots", Appl. Phys. Lett. 62(3), Jan. 1993, pp. 225-227) (IDS filed on 11/13/06) (Masumoto'1993) in view of Masumoto et al.'1978.

21. Regarding claim 1, Masumoto'1993 discloses a laser device (fig. 1) for causing lasing by using a semiconductor quantum dot, comprising a laser member (CuCl quantum dots embedded in a NaCl crystal, fig. 1) in which said semiconductor quantum dot is formed; a resonating section (formed by dielectric mirrors) for resonating light generated in the laser member; and an excitation light source section (a nitrogen laser excitation, fig. 1) for irradiating the laser member with excitation light (see abstract). Masumoto'1993 does not disclose the excitation light source section for irradiating the laser member with excitation light whose energy corresponds to two-photon resonant excitation, so as to form a biexciton state in the semiconductor quantum dot by the two-photon resonant excitation. Masumoto'1978 discloses two-photon resonance excitation of biexcitons in CuCl by picoseconds pulses (paragraph under 3p-BG-9). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser device of Masumoto'1993 with the two-photon resonant excitation as taught by Masumoto'1978 in order to obtain an improved S/N ratio (paragraph under 3p-BG-9 of Masumoto'1978).

22. Regarding claim 2, Masumoto'1993, when modified by Masumoto'1978, discloses a continuous irradiation period in which said excitation light source section

Art Unit: 2828

continuously irradiates the laser member with excitation light is of the order of picoseconds (paragraph under 3p-BG-9 of Masumoto'1978).

23. Regarding claim 3, Masumoto'1993 and Masumoto'1978 have disclosed the laser device outlined in the rejection to claim 1 above. Masumoto'1993 and Masumoto'1978 do not explicitly disclose a continuous irradiation period in which said excitation light source section continuously irradiates the laser member with excitation light is of the order of femtoseconds. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser device of Masumoto'1993 and Masumoto'1978 with excitation light of the order of femtoseconds in order to obtain a desired output power.

24. Regarding claim 4, Masumoto'1993 discloses said laser member includes the semiconductor quantum dot and a base material retaining the semiconductor quantum dot; said semiconductor quantum dot is made of any one of CuCl, CuBr, CdSe, CdS (CuCl quantum dots, fig. 1); and said base material is made of glass or alkali halide crystal (NaCl crystal, see abstract).

25. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masumoto et al.'1993 and Masumoto et al.'1978 as applied to claim 1 above, and further in view of Ledentsov N. N. et al. ("Optical properties of heterostructures with InGaAs-GaAs quantum clusters", Semiconductors 28(8), Aug 1994, pp. 832-834) (IDS filed on 11/13/06).

Art Unit: 2828

26. Regarding claim 5, Masumoto'1993 and Masumoto'1978 have disclosed the laser device outlined in the rejection to claim 1 above. Masumoto'1993 further discloses said laser member includes the semiconductor quantum dot (CuCl quantum dots) and a base material (NaCl crystal) retaining the semiconductor quantum dot (see abstract of Masumoto'1993). Masumoto'1993 and Masumoto'1978 do not disclose said semiconductor quantum dot is made of InAs or InGaSb; and said base material is made of GaAs. Ledentsov discloses a lasing material with InGaAs-GaAs quantum clusters comprising semiconductor quantum dot made of InAs, and base material made of GaAs (see abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser device of Masumoto'1993 and Masumoto'1978 with the InAs quantum dot and the GaAs base material as taught by Ledentsov in order to obtain various wavelength outputs.

27. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masumoto et al.'1978.

28. Regarding claim 9, Masumoto'1978 has disclosed the lasing method outlined in the rejection to claim 7 above. Masumoto'1978 does not explicitly disclose a continuous irradiation period of said excitation light is of the order of femtoseconds. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the lasing method of Masumoto'1978 with excitation light of the order of femtoseconds in order to obtain a desired output power.

Conclusion

29. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Shields et al. (US PG Pub 2003/0218143 A1) and Shields et al. (US PG Pub 2002/0196827 A1) disclose a laser device similar to the claimed invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YUANDA ZHANG whose telephone number is (571)270-1439. The examiner can normally be reached on Monday-Friday, 9:00am-5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number: 10/589,243
Art Unit: 2828

Page 10

/Yuanda Zhang/
Examiner, Art Unit 2828